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ABSTRACT

In this report, vision screenings conducted by large metropolitan area schools are reviewed. Data were generated by 10 participating schools in five school districts who responded to five research questions: (1) Do you do vision screening? (2) What do you test for? (3) Who conducts the vision screening in your school? (4) What grade levels are screened? (5) How often are the children screened? In general, many inadequacies exist in schools regarding vision screening. Recommendations include greater participation in the public school arena by vision specialists and the development of a consistent criteria for vision screening in school districts. (Author/JD)

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AN ANALYSIS OF VISION SCREENING IN SCHOOL AGE CHILDREN

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Introduction

Health appraisal is an integral part of the school health program as well as vital for the well-being and development of the school age child. Specifically, vision screening examinations are designed to identify children who are in need of visual care. They do not, however, diagnose or determine the cause(s) of visual problems. (4) Vision screening has become a common practice in the public school since learning deficiencies are often related to vision disorders. (7) However, a controversy exists in determining a standard for such tests which, if too abbreviated, often leave many eye related problems undetected.

Numerous studies have been conducted with attempts to determine the vision characteristics of school age children. Prior to 1950, however, little attempt had been made to evaluate screening methods. With the development of a variety of screening procedures, researchers began to compare their results to clinical observation made by vision professionals. Thus, the screening methods were evaluated in terms of their correct-referrals, under-referrals and over-referrals as determined by optometrists and/or ophthalmologists and the research literature began to reflect data results. (2,5,6,8)

The effects of visual disorders on learning deficiencies are well documented. (2) Of all the visual problems that could have an impact on the ability to process information, visual acuity problems caused by refractive errors appear to be most problematic. Acuity problems caused by refractive errors occur when the eye does not have a sharp, well-focused image projected on the retina. The three major types of

refractive errors are myopia (affecting far point acuity), hyperopia (primarily affecting near point acuity), and astigmatism (primarily caused by an imperfectly shaped cornea). Interestingly enough, each of these problems can be detected by appropriate vision screening measures.

As early as 1950, researchers, eye care professionals, and educational researchers called for vision screening for children in schools. And, although everyone (parents, school personnel, law makers, etc.) seems to lend a sympathetic ear to the plea, in most states, there is no consistent policy about vision screening in terms of who should conduct it or how much should be done. In some states there is even a question as to whether it should be required by law.

A controversy exists within the health community about determining a standard for vision screening tests which, if too abbreviated, leave many eye related problems undetected. There is no consistent criteria with regard to screening tests and therefore some schools may be more thorough than others. One good screening examination is the Modified Clinical Technique (MCT) which screens for organic, visual acuity, refractive and binocular coordination problems. (1) Defects in any of these areas would have a profound effect on the educability of the child.

Seeing distant objects, like a blackboard, is a measure of far point acuity. Since this is the most basic of all vision tests, it should be assumed that most schools that conduct vision screening, screen for this visual problem and most utilize a Snellen chart to assess far point acuity.

The ability to see objects like book print is a measure of near point acuity. Schools that do screen for visual problems are less likely to conduct near point acuity screening than far point screening but more likely to screen for near point acuity than any of the other potential visual

problems discussed below.

Ametropia is a visual problem that is the result when the refractive power of the cornea and lens and the length of the globe are not correlated so that rays of light parallel to the visual axis upon entering the eye do not come to focus on the fovea centralis of the retina. Hyperopia is that refractive condition in which parallel rays of light are intercepted by the retina before coming to focus. Hyperopia may be asymptomatic in children because of their power of accomodation. However, eventually the hyperope will suffer ocular fatigue from extended use of the eyes doing near work such as school work. It is unlikely that most schools screen for hyperopia.

Many learning tasks involve a color orientation and color vision tests are very easy to conduct. Pathology refers to any disease of the eye.

Binocularity refers to how well both eyes work together. Binocularity problems seldom affect clarity of vision, but poor binocularity creates stress and fatigue on the visual system. Students with significant binocularity problems cannot sustain in-school tasks such as reading and writing. Stereopsis is a form of binocularity referred to, by the layperson, as depth perception. Again, it is unlikely that many schools screen for stereopsis problems despite the fact that tests are easy to conduct and accurate in determining if a problem exists.

Objectives

There is a great deal of literature that indicates that too many children finish school unable to read and cipher. The indictments, to date, have been toward teachers and schools. Based upon the logic that you can't fix it if you don't know where it is broken, and assuming that visual problems can be considered, at least in part, a detriment to learning, the first

objective is to determine how much vision screening is taking place in the selected schools.

Selection of the screening test to be used is a difficult task for the school primarily because, screening is typically not done by an optometrist nor an ophthalmologist but by school nurses, physical educators, health educators or minimally-trained laypersons. All too often, vision screening tests conducted by nonspecialists result in over-referrals or under-referrals. Over-referrals involve detection of a false-positive in which the child is found to have no visual problems after the completion of a professional examination. The primary cause of over-referrals is screening examinations that are too sophisticated for the limited training of the personnel who screen. The net effect of over-referrals is unneeded expense for the child's parents and embarrassment to the school. Under-referrals occur when visual problems go undetected. This can result in learning difficulties in the child with a visual problem.

Of the two referral issues, under-referral is considered most problematic from the standpoint of student health and education. Since referral problems are an issue, it is appropriate to determine the qualifications of those persons who conduct vision screening.

The second objective is to determine exactly who conducts vision screening in the selected schools.

Based upon the objectives stated, the main questions asked in this study are: what vision screening is done in the selected schools, by whom and how often?

Methods

Houston area public schools were each assigned a sequenced number. A table of random numbers was employed to select a sample of ten schools to be surveyed. Since there are approximately 480 public schools in the Houston area, the probability of any one school being selected for this survey is 2.08 percent.

The school nurse was designated as the contact person for survey information. These individuals were asked to respond to the following questions:

1. **Do you do vision screening?**
2. **Do you test for the following:**
   a. **Visual acuity (20')?**
   b. **Visual acuity (16")?**
   c. **Hyperopia?**
   d. **Color vision?**
   e. **Binocular alignment?**
   f. **Pathology?**
   g. **Stereopsis?**
   h. **Other?**
3. **Who conducts the vision screening in your school?**
4. **What grade levels are screened?**
5. **How often are the children screened?**

Design

This study was exploratory in nature. (3) As such, it attempts to investigate observed events in a cross-sectional manner. The study was designed to determine what screening methods are used in the schools of a

large metropolitan area.

Questions asked of each school with regard to screening methods were designed by consultation of professors at the University of Houston, College of Optometry, through a search of the literature and indicative of the major types of vision problems experienced by school-aged children. School nurses were told that this was a research project and the demands upon their time would be minimal. Without exception, each school nurse complied with the researchers' request and answered the questions.

Results

Texas schools from Houston, Channelview, Cypress-Fairbanks, Klein and Katy Independent Districts were selected for administration of the survey instrument. These schools included:

1. Jersey Village Senior High
2. Hancock Elementary
3. Alice Johnson Junior High
4. Addicks Elementary
5. West Memorial Junior High
6. Hamilton Junior High
7. Brill Elementary
8. Lamar Mirabeau Senior High
9. Hildebrandt Intermediate
10. De Zavala Elementary

Table 1 shows the screening method(s) by school. According to the table, schools 1, 2, 4, 5, and 6 test for visual acuity at distance only. Schools 3, 7, 9, and 10 employ the Titmus device which screens for binocular alignment, stereopsis, and visual acuity at distance and near. (2)

School 7 tests for color vision with the Ishihara color plates. Color vision testing at school 7 is conducted, however, if it is recommended by the teacher or parent. Finally, school 10 tests for hyperopia by using a plus lens.

In terms of percentages, 100 percent of the schools conduct some form of vision screening as mandated by law. Figure 1 shows the schools by percentage with regard to screening method. According to the table, 100 percent test for visual acuity at distance, 40 percent test for visual acuity at near, binocular alignment and stereopsis, 10 percent test for color vision and hyperopia. None of the schools test for pathology.

Undetected visual problems that arise from incomplete vision screenings could have profound implications for education. For example, 90 percent of the schools surveyed do not test for color vision. Although the students with this deficit do not generally need treatment, it is important to identify this problem so that the teacher may be aware of the difficulties the student with a color deficiency may encounter.

Sixty percent of the schools do not test for visual acuity at near and only ten percent test for farsightedness using a plus lens at distance. The schools that do not include these quick and simple tests are running the risk of not detecting the student who may be suffering from hyperopia. While performing near tasks, these students may become easily fatigued and experience headaches and asthenopia. This can result in a lack of motivation due to the difficulties encountered with extended periods of near work and lead to poor school performance.

Finally, less than half of the schools investigate binocular alignment and stereopsis problems. Once again, the effort the child must exert to perform at near tasks may hinder his or her potential to succeed in the

classroom. If the child is not equipped with clear, single, binocular vision and accurate depth perception, simple reading tasks and activities requiring precise eye-hand coordination may be increasingly difficult.

Table 2 shows shows screening by personnel, time and grade level of students. According to the table, the school nurse conducts the majority of the vision screenings. However, approximately 30 percent of the schools employ laypersons, physical educators or health educators to assist the nurse in screening procedures.

It can be seen by Table 2 that most schools do screening yearly or by referral. Additional information from Table 2 shows that wide variability exists in terms of what grades are screened. For some schools, students are screened yearly, while in other schools, screening is done only once during the student's time in school.

Conclusions and Recommendations

Based upon the results of this study and according to published literature and a review of experienced professionals, many inadequacies exist in Houston area schools regarding vision screening. As evidenced by this survey, a large percentage of the schools test only for one possible visual impairment. A smaller percentage test for more than one vision problem. However, none could be found to perform comprehensive vision screening. Additionally, paraprofessionals and laypersons were designated as test administrators. None of the schools surveyed utilized the services of eye care specialists such as optometrists or ophthalmologists. Another survey finding was that there was no inter-school consistency in terms of how often screening is conducted or by which grade level(s).

In light of these data, several recommendations can be made:

1. The accuracy of vision screening examinations might be increased if workshops and /or training sessions for school nurses with regard to effective screening methods were offered during state nurse's meetings/conventions.

2. Nurses who participate in these training programs should seek out qualified eye care professionals and make subsequent referrals in order to maintain continuity and monitor success of the screening program.

3. Criteria for consistency pertaining to vision screening tests to be used in every school should be delineated by some governing board or organization such as a state's optometric association. This delineation of testing should imply more comprehensive vision screening.

As can be seen by the results of this study, many potential visual problems are not screened for. It seems regretable that although some important components of a comprehensive vision screening are easily conducted and cost-effective, they are being neglected in most schools.

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Figure 1 - Screening Method by Percentage

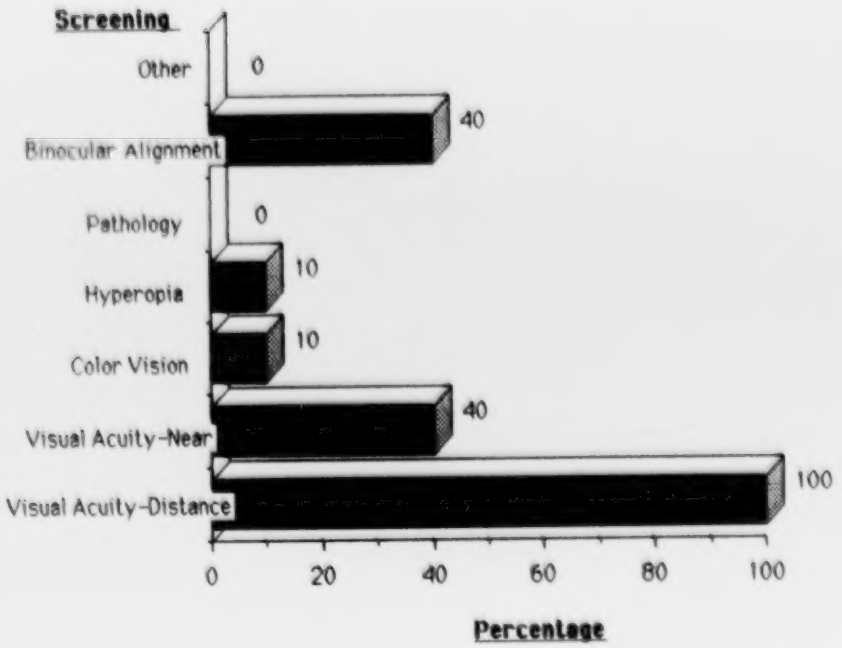

Table 1--**Screening Methods by School**

School	1	2	3	4	5	6	7	8	9	10
Does the school screen?	x	x	x	x	x	x	x	x	x	x
VA at distance?	x	x	x	x	x	x	x	x	x	x
VA at near?	-	-	x	-	-	-	x	-	x	x
Color vision?	-	-	-	-	-	-	x	-	-	-
Hyperopia?	-	-	-	-	-	-	-	-	-	x
Pathology?	-	-	-	-	-	-	-	-	-	-
Binocular align?	-	-	x	-	-	-	x	-	x	x
Stereopsis?	-	-	x	-	-	-	x	-	x	x
Other?	-	-	-	-	-	-	-	-	-	-

x = procedure conducted
- = procedure not conducted

Table 2--**Personnel Who Screen, Time and Grade Level of Screening for Schools 1 -10.**

School	1	2	3	4	5	6	7	8	9	10
Who Screens?	N	N,L	N	N	N	N,H/PE	N	N,H/PE	N	N
How Often?	1yr	1yr	1yr	1yr	1yr	1yr	1yr	1yr	1yr	1yr
What Grades?	9-10	K-5	7+ new students	K-2, 4+ new students	K,1, 3,5, new students+ referrals	7	K-5	10+ new students	6-8	3,5+ new students

N = School Nurse
L = Trained Layperson
H/PE = Health or Physical Education Teacher